



GEMS Challenges---- Chromatography

SUBJECT

Science--
Chromatography

Suggested grades

4-12

Cautions/concerns

Use goggles and be in a well-ventilated space. Have lots of paper towels ready.

The Challenge—Determine the molecules in color inks

LEADER ACTIONS

GIRL ACTIONS

INTRODUCTION	Present the challenge—you have black markers that all look the same on the outside, but make different colored marks on paper. What could be the cause of this?	Brainstorm options
BACKGROUND INFORMATION	<p>State that today we are using a method called chromatography to learn about solutions. Ask the girls what they think that word means. (think 'chroma'—color and 'graph'—write) We are going to see what kinds of colors are in these markers and determine if they are all the same.</p> <p>Ask the girls why scientists would want to know the makeup of ink, or of any other substance. Lead them to forensics, to determining sugar content, poisons, chemicals in food, etc.</p> <p>You are going to be testing two different variables—water on permanent marker and a diluted alcohol solution on permanent markers.</p>	Think about what the roots of chromatography could be—what does it mean?
ACTIVITY	<p>Pass out goggles and remind girls that they must be worn at all times. Pass out coffee filter strips, 4 stirrers, 4 large cups, 2 small cups, 2 droppers, 4 binder clips and paper towels to each girl.</p> <p>Have each girl choose 2 markers to test: 1 sharpie and 1 of another brand.</p> <p>Have each girl label her cups—small cups—W (water) and A (Alcohol) and large—SW (sharpie/water), SA(sharpie/alcohol), OW(Other/water)</p>	<p>Put on goggles.</p> <p>Choose two different markers—one sharpie and one other brand.</p> <p>Prepare work space by labeling cups and strips.</p>

LEADER ACTIONS

GIRL ACTIONS

	<p>and OA(Other/Alcohol). Then have each girl label her strips with the pencil—on one end of each put the same labels—SW, SA, OW, and OA.</p> <p>Have each girl make a large dot on each of the coffee filter strips with each of the two markers about ½ inch from the bottom. Then have them lay the stirrer across the top of a large cup and attach the coffee filter strip to the stirrer with the binder clip so that it just touches the bottom of the cup.</p> <p>Pour a little water into each girl/team's small water cup. Pour a little of the alcohol solution into their marked alcohol cup.</p> <p>Have each girl/team drop 3-4 droppers of water into the water cups. They should stop when the water touches the strip but not the dot. Observe for a minute. What is happening?</p> <p>Do the same thing with the alcohol solution. Make sure the solution does not run down the strip before reaching the bottom of the cup.</p> <p>Have the girls observe the strips. Discuss the differences among the four strips.</p> <p>Lift the strips out and lay them on paper towels. Compare the sharpie strips to the other brands. Can you match up the sharpies and the other brands just by their patterns of color dispersion?</p>	<p>Put a dot on each of the coffee filter strips and suspend them with the stirrer and the clip inside each large cup, just touching the bottom. The dot on the strip should be at the bottom of the strip.</p> <p>Drop 3-4 droppers full of water into the water cup. Stop when the water touches the strip, but does not reach the dot.</p> <p>Drop 3-4 droppers full of the alcohol solution into the alcohol cups.</p> <p>Observe. What is happening? What are the differences between the two kinds of markers? What different effects does the water have on the strip compared to the alcohol?</p> <p>Lift the strips out and lay them on paper towels. Compare and discuss.</p>
CONCLUSION	Discuss how the experiment went. What did they see? How could this apply in other fields? Do other things have unique patterns of colors or chemistry?	

LEADER ACTIONS**GIRL ACTIONS**

REFLECTION	Ask 2-3 girls to take a reflection card and reflect on their experience.	Reflect on the experience.
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Supplies

For each girl or team:

- 10 strips of cut-up coffee filters, each about 4 by 1 ½ inches

For each table group:

- 5-6 new black sharpies
- 5-6 new black permanent markers-not sharpies
- Goggles
- Disposable eye droppers
- Lots of clear plastic cups (4 large, 2 small per girl or team.)
- Pencils
- Binder clips
- Coffee stirrers

Preparation needed

- Try this first at home.
- Dilute the 90% alcohol with equal parts water. Keep it covered with plastic wrap or in a marked bottle so that it does not evaporate.

Comments

This experiment can easily be done in teams of two girls.

The next step for this is to do it on t-shirts or cotton bags or hats. Many resources can be found online.